User's Guide

CDE-440 Series
Conductivity Process Cells

omega.com

OMEGAnet® Online Service omega.com	Internet e-mail info@omega.com

Servicing North America:

U.S.A.:
ISO 9001 Certified
One Omega Drive, P.O. Box 4047
Stamford, CT 06907-0047
TEL: (203) 359-1660
FAX: (203) 359-7700
e-mail: info@omega.com

Canada:
976 Bergar
Laval (Quebec) H7L 5A1, Canada
TEL: (514) 856-6928
FAX: (514) 856-6886
e-mail: info@omega.ca

For immediate technical or application assistance:

U.S.A. and Canada: Sales Service: 1-800-826-6342/1-800-TC-OMEGA®
Customer Service: 1-800-622-2378/1-800-622-BEST®
Engineering Service: 1-800-872-9436/1-800-USA-WHEN®

Mexico:
En Español: (001) 203-359-7803
e-mail: espanol@omega.com
FAX: (001) 203-359-7807
info@omega.com.mx

Servicing Europe:

Czech Republic:
Frystatska 184, 733 01 Karviná, Czech Republic
TEL: +420 (0)59 6311899
FAX: +420 (0)59 6311114

Toll Free: 0800-1-66342
e-mail: info@omegashop.cz

Germany/Austria:
Daimlerstrasse 26, D-75392 Deckenpfronn, Germany
TEL: +49 (0)7056 9398-0
FAX: +49 (0)7056 9398-29
Toll Free in Germany: 0800 639 7678
e-mail: info@omega.de

United Kingdom:
ISO 9002 Certified
One Omega Drive, River Bend Technology Centre
Northbank, Irlam, Manchester
M44 5BD United Kingdom
TEL: +44 (0)161 777 6611
FAX: +44 (0)161 777 6622
Toll Free in United Kingdom: 0800-488-488
e-mail: sales@omega.co.uk

Instructions Manual

Conductivity Cells

CDE-440-001/CDE-440-01/CDE-440-1/CDE-440-5/CDE-440-01T/CDE-442

Index

3. Conductivity Cells

Cell is composed basically by two boards or two concentric cylinders(electrodes), with well defined geometry. The space between the boards or cylindres creates a solution collumn, being so the measurement is independent from the total solution volume.
The boards or cylindres geomety used will be related to the solutions concentration for a better reading of different samples we vary the distance (and;or) the board section.
The relation “distance” (d) over the “section” (s) determines the Cell Constante $(K) . \frac{d}{s} = K .$
In order to obtain good results it is necessary to choose the specific cell for the desired application. Three factors are extremelly important in order to choose the right cell: the Electrical, the Mechanical and the chemical.

Electrical

When reading an electrolyte concentrationof high resistance, caused by low quantity of ions, the greater sensibility will be obtained with bigger electrodes and with a small distance between them. Consequently, we shall diminish the capacitive reatance of the cell-solution system, increasing the polarization tension frequency supplied by the equipment.
We will need the inverse when the electrolite is very concentrate: small electrodes with long distances in order to avoid saturation and the polarization effect at the electrodes.
The Cell will present low "K" for low conductivity electrolites and high "K" for those of high conductivity, considering that the equipment must have an automatic exchange of the adequate frequency.

Mechanical

Some significant factors are: the pressure, temperature, flow speed and the solid suspension presence. only when all these factors are considered that will be achieved a satisfactory performance with a minimum maintenance. When the systems temperature and pressure are higher than the specified values, it must be installed a cooling system with a restraining valve before the cell contact.
In places where the flow speed is very low, it must be provided with a flow increase for a solution exchange. solid presence will influence because of obstruction that they can cause at the electrodes or even a super conduction (in metal cases).

Chemical

It is necessary to consider the chemical aggressiveness and clogging caused at the electrodes, this can modify the geometry, altering the constant value.
In these cases, the electrodes must be chemically aggressive and must be cleaned periodically.

4. Mechanical Description

Based on process conditions, the cells must be build of material previously specified, such as: Stainless Steel 316, Epoxy or PTFE with radial electrodes or SS316 annulars, Platinum, Titanium or others depending on its resistance to the solutions chemical aggressiveness .
The electrical connection is done in isolated teminals with ceramic base located at the cast aluminum head, SAE 323, with low oxydation degree, treated against corrosion and finished with electrostatic epoxy paint. The head offers IP-67 protection, allowing the instrumentation cable to go thru by a ½"NPT threaded hole or a ½" cable knockout.

Insertion Cell CDE-440-01

Cell Models CDE-440-001, CDE-440-01, CDE-440-1, CDE-440-5 and CDE-440-01T are called Insertion or Immersion Cells.

Toroydal Cell CDE-442

Cell Model CDE-442 is called Toroydal or Electrodeless Cell, as it does not offer electrodes. The body material could be Epoxy or PTFE, where the Toroydal nucleus (2) are located, indulging an electromagnetic field, that will generate an electrical current (called Focault Current) proportional to the sample concentration. This type of cell is recommended for high clogging concentration and highly chemically aggressive.

This Cell can only be used with Conductivity Analyzer Model# CDCN442.

5. Technical Specifications

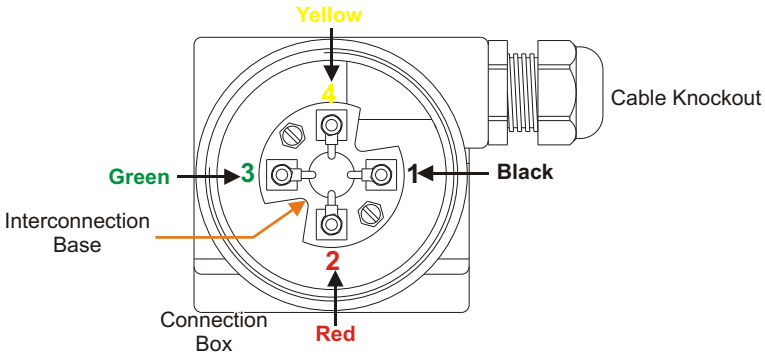
Model	CDE-440-001	CDE-440-01	CDE-440-1	CDE-440-5	CDE-440-1T	CDE-442
Type	Insertion					Torroid
Range (S/cm)	0.01µS to 2mS	0.1µS to 20mS	1µS to 100mS	10µS to 150 mS	0.1µS to 20mS	1mS to 1S
Cell Constant (K) cm^{-1}	0.01	0.1	1	5	0.1	NA
Temperature(@ Atm Pressure)	0 to 100ºC				0 to 200ºC	0 to 100ºC
Max. Pressure(@25ºC)	10 Kgf/cm^2				20 Kgf/cm^2	10 Kgf/cm^2
Insetion length(mm)	54	42 to 2000	60		90	100
Process Connection	Threaded ¾ NPT				Threaded 1" ½ NPT	Threaded Point
Body Material	SS316	SS316	SS316	SS316	SS316	PTFE

6. Installation

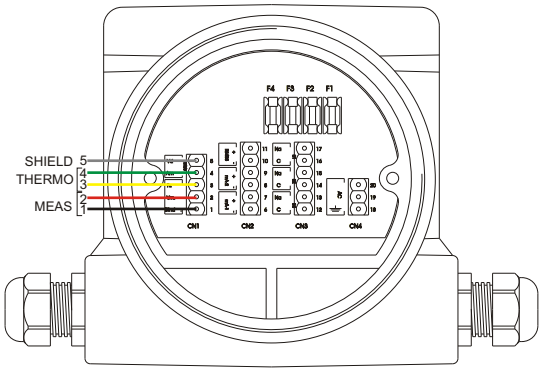
Before you install your conductivity cell, please verify for any possible bubbles and if the sample is constantly renewed.

ELECTRICAL CONNECTION

1. Prepare the cell installation point in area that offers good stirring, it is preferred to be close to the equipment (maximum of 10 meters -32 feet) and exempt of vibrations.
2. Verify if all threaded points are tied.
3. Proceed with the instrumentation cable connection originating from the equipment, going thru the cable knockout of the electrical connection box and connecting it to the interconnection base.



4. Electrical installation example between the equipment and the cell.



5. Verify if the cable knockouts are **firmly attached** to its respective interconnection cables. This is very important so the enclosure still offers IP-67. Sealing is crucial for a perfect performance
6. Be careful with humidity! It will diminish the impedance generating measuring errors. Verify the cable press and if necessary, dry the area using a hair dryer.
7. Be careful when tying threaded areas, depending on the cable position, it can be cut!

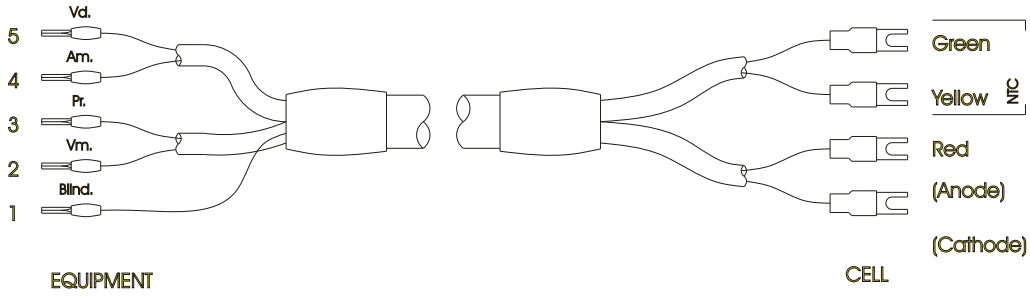
Note: Cell model CDE-442 do not offer a connection box and it is necessary a good instrumentation cable Sealing only at the equipment, as they do not offer connection cable.

6. Installation (cont.)

Interconnection Cable

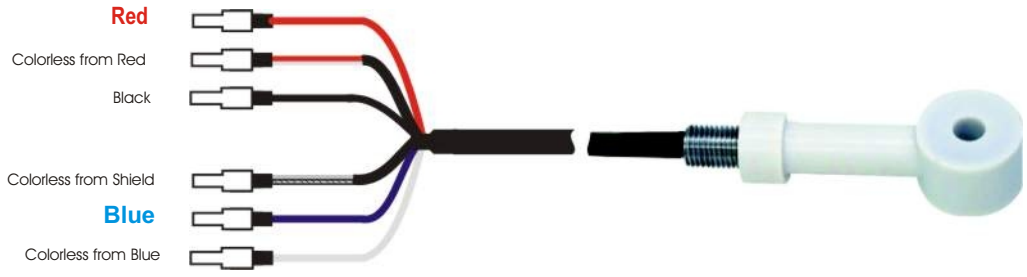
a) Do not cut on mend the cell cables!

Interconnection Cable



CDE-442 Cell Interconnection

This cell type is also connected directly to the equipment connection barr, so cable terminal pin type are used for some equipment cases.

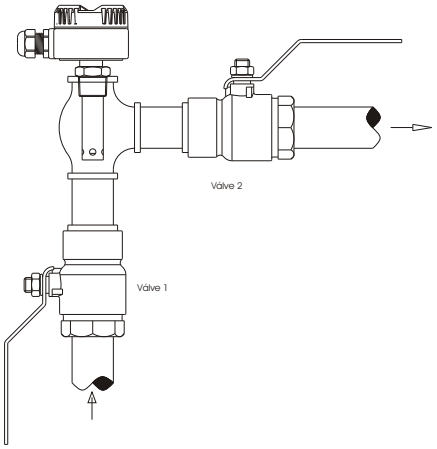


6. Installation (cont.)

Insertion Type

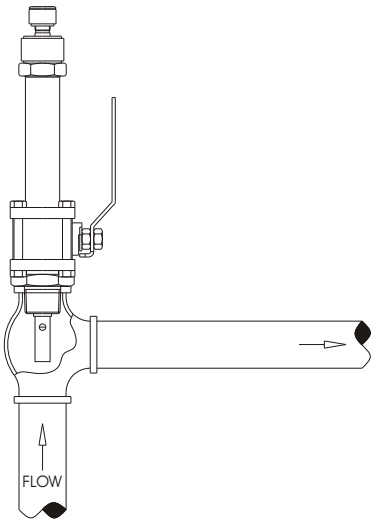
For a correct conductivity measurement, it is recommended to install the cell as shown on below Illustration.

The liquid flow must go thru the Sensor and exit thru the holes located at the upper portion of the sensor. See indicative arrows shown below, showing the recommended liquid flow.



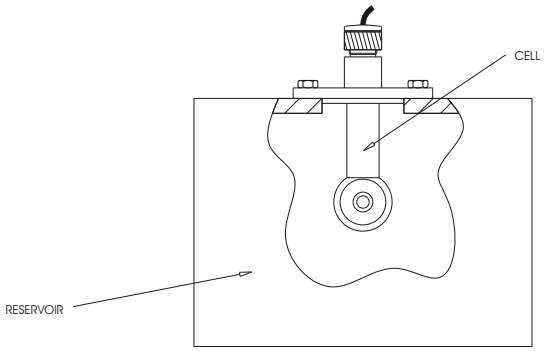
Retractile Insertion Cell

For Retractable Insertion Cell installation, allow the liquid to exit thru the holes located on the upper portion of the electrode or vice-versa.

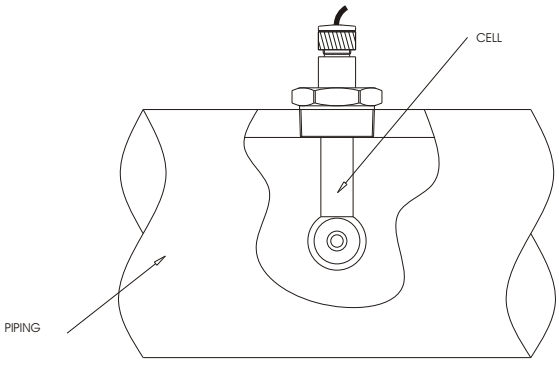


Torroydal Type

Torroydal cell CDE-442 generally must be installed in a Transfluency Body made out of lower magnetic permeability material. Special attention must be observed regarding the sample flow being



Flanged



Threaded Point

7. Maintenance

All OMEGA equipments, are shipped from factory tested and calibrated. When under operation, the Conductivity Cell must be maintained periodically (the frequency will depend on the process), which would be basically cleaning, or if necessary, a new calibration.

Cleaning

Dip the electrodes in cleaning solution for 40 seconds, then wash throughly with deionized water to avoid standard contamination, when it is time to perform a calibration.

Calibration

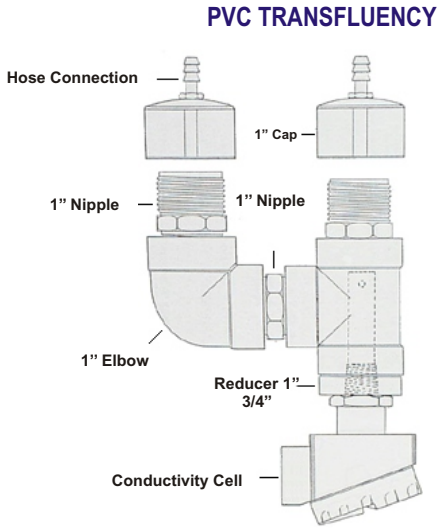
Equipments with range of 0 to 200µS or higher.

1. Dip cell 3 or 4 times in standard compatible with the equipment range. Wait 1 minute before you can adjust the A.T.C. (Automatic Temperature Compensation), If necessary, move it vertically (up and down) in order to eliminate any bubbles.
2. Proceed with the constant adjustment.
3. Repeat the operation "1" two or three times in order to confirm the value.

Calibration for Low Conductivity Reading(Ultra Pure Water)

Range 0.01µS thru 2µS

1. Assemble the Transfluency Cell and wash it well.



2. Using a 500 mL beaker, place approximately 400 mL of deionized or distilled water. Using a Conductivity Meter, adjust the conductivity value to approximately 50% of range value, "contaminating" with high conductivity water (example: tap water).
3. Fill the transfluency with 146.9 uS/cm standard and return to the beaker many times in order to rinse and eliminate contaminations. Finally leave the transfluency filled with the standard.
4. Verify the standard conductivity value and thru "constant adjustment" reproduce the same read value at the equipment to be calibrated.

Repeat this operation many times until you can reproduce at least three times the calibrated value.

8. Troubleshooting

1) When Calibrating the equipment, the function is not complete

Verify for humidity presence at probes header or at connection box of the equipment.
Another possibility could be the equipments interconnection cable and cell being cut or in short.

2) Reading above Range

First clean the cell and try to calibrate it. If this operation is not succefull, verify the point where the cell is connected, making sure bubbles are not present and if the solution is flowing normally.

WARRANTY/DISCLAIMER

OMEGA ENGINEERING, INC. warrants this unit to be free of defects in materials and workmanship for a period of **13 months** from date of purchase. OMEGA's WARRANTY adds an additional one (1) month grace period to the normal **one (1) year product warranty** to cover handling and shipping time. This ensures that OMEGA's customers receive maximum coverage on each product.

If the unit malfunctions, it must be returned to the factory for evaluation. OMEGA's Customer Service Department will issue an Authorized Return (AR) number immediately upon phone or written request. Upon examination by OMEGA, if the unit is found to be defective, it will be repaired or replaced at no charge. OMEGA's WARRANTY does not apply to defects resulting from any action of the purchaser, including but not limited to mishandling, improper interfacing, operation outside of design limits, improper repair, or unauthorized modification. This WARRANTY is VOID if the unit shows evidence of having been tampered with or shows evidence of having been damaged as a result of excessive corrosion; or current, heat, moisture or vibration; improper specification; misapplication; misuse or other operating conditions outside of OMEGA's control. Components in which wear is not warranted, include but are not limited to contact points, fuses, and triacs.

OMEGA is pleased to offer suggestions on the use of its various products. However, OMEGA neither assumes responsibility for any omissions or errors nor assumes liability for any damages that result from the use of its products in accordance with information provided by OMEGA, either verbal or written. OMEGA warrants only that the parts manufactured by the company will be as specified and free of defects. OMEGA MAKES NO OTHER WARRANTIES OR REPRESENTATIONS OF ANY KIND WHATSOEVER, EXPRESSED OR IMPLIED, EXCEPT THAT OF TITLE, AND ALL IMPLIED WARRANTIES INCLUDING ANY WARRANTY OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE HEREBY DISCLAIMED. LIMITATION OF LIABILITY: The remedies of purchaser set forth herein are exclusive, and the total liability of OMEGA with respect to this order, whether based on contract, warranty, negligence, indemnification, strict liability or otherwise, shall not exceed the purchase price of the component upon which liability is based. In no event shall OMEGA be liable for consequential, incidental or special damages.

CONDITIONS: Equipment sold by OMEGA is not intended to be used, nor shall it be used: (1) as a "Basic Component" under 10 CFR 21 (NRC), used in or with any nuclear installation or activity; or (2) in medical applications or used on humans. Should any Product(s) be used in or with any nuclear installation or activity, medical application, used on humans, or misused in any way, OMEGA assumes no responsibility as set forth in our basic WARRANTY/DISCLAIMER language, and, additionally, purchaser will indemnify OMEGA and hold OMEGA harmless from any liability or damage whatsoever arising out of the use of the Product(s) in such a manner.

RETURN REQUESTS/INQUIRIES

Direct all warranty and repair requests/inquiries to the OMEGA Customer Service Department. BEFORE RETURNING ANY PRODUCT(S) TO OMEGA, PURCHASER MUST OBTAIN AN AUTHORIZED RETURN (AR) NUMBER FROM OMEGA'S CUSTOMER SERVICE DEPARTMENT (IN ORDER TO AVOID PROCESSING DELAYS). The assigned AR number should then be marked on the outside of the return package and on any correspondence.

The purchaser is responsible for shipping charges, freight, insurance and proper packaging to prevent breakage in transit.

FOR **WARRANTY** RETURNS, please have the following information available BEFORE contacting OMEGA:

1. Purchase Order number under which the product was PURCHASED,
2. Model and serial number of the product under warranty, and
3. Repair instructions and/or specific problems relative to the product.

FOR **NON-WARRANTY** REPAIRS, consult OMEGA for current repair charges. Have the following information available BEFORE contacting OMEGA:

1. Purchase Order number to cover the COST of the repair,
2. Model and serial number of the product, and
3. Repair instructions and/or specific problems relative to the product.

OMEGA's policy is to make running changes, not model changes, whenever an improvement is possible. This affords our customers the latest in technology and engineering.

OMEGA is a registered trademark of OMEGA ENGINEERING, INC.

Where Do I Find Everything I Need for Process Measurement and Control? OMEGA...Of Course!

Shop online at omega.com

TEMPERATURE

- Thermocouple, RTD & Thermistor Probes, Connectors, Panels & Assemblies
- Wire: Thermocouple, RTD & Thermistor
- Calibrators & Ice Point References
- Recorders, Controllers & Process Monitors
- Infrared Pyrometers

PRESSURE, STRAIN AND FORCE

- Transducers & Strain Gages
- Load Cells & Pressure Gages
- Displacement Transducers
- Instrumentation & Accessories

FLOW/LEVEL

- Rotameters, Gas Mass Flowmeters & Flow Computers
- Air Velocity Indicators
- Turbine/Paddlewheel Systems
- Totalizers & Batch Controllers

pH/CONDUCTIVITY

- pH Electrodes, Testers & Accessories
- Benchtop/Laboratory Meters
- Controllers, Calibrators, Simulators & Pumps
- Industrial pH & Conductivity Equipment

DATA ACQUISITION

- Data Acquisition & Engineering Software
- Communications-Based Acquisition Systems
- Plug-in Cards for Apple, IBM & Compatibles
- Datalogging Systems
- Recorders, Printers & Plotters

HEATERS

- Heating Cable
- Cartridge & Strip Heaters
- Immersion & Band Heaters
- Flexible Heaters
- Laboratory Heaters

ENVIRONMENTAL MONITORING AND CONTROL

- Metering & Control Instrumentation
- Refractometers
- Pumps & Tubing
- Air, Soil & Water Monitors
- Industrial Water & Wastewater Treatment
- pH, Conductivity & Dissolved Oxygen Instruments

M-4506/0908